SECTION 31 32 19.16
GEOTEXTILE

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards that may be referenced in this section:

1. ASTM International (ASTM):
   a. D737, Standard Test Method for Air Permeability of Textile Fabrics.
   b. D4355, Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
   c. D4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
   d. D4533, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
   e. D4595, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
   f. D4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
   g. D4716, Test Method for Determining the (In-Plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
   h. D4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
   i. D4833, Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
   j. D4884, Standard Test Method for Strength of Sewn or Thermally Bonded Seams of Geotextiles.
   k. D4886, Standard Test Method for Abrasion Resistance of Geotextiles (Sand Paper/Sliding Block Method).
   l. D5199, Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.
   m. D5261, Standard Test Method for Measuring Mass per Unit Area of Geotextiles.
   n. D6193, Standard Practice for Stitches and Seams.

1.02 DEFINITIONS

A. Fabric: Geotextile, a permeable geosynthetic comprised solely of textiles.

B. Maximum Average Roll Value (MaxARV): Maximum of series of average roll values representative of geotextile furnished.

C. Minimum Average Roll Value (MinARV): Minimum of series of average roll values representative of geotextile furnished.

D. Nondestructive Sample: Sample representative of finished Work, prepared for testing without destruction of Work.

E. Overlap: Distance measured perpendicular from overlapping edge of one sheet to underlying edge of adjacent sheet.

F. Seam Efficiency: Ratio of tensile strength across seam to strength of intact geotextile, when tested according to ASTM D4884.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
   a. Manufacturer material specifications and product literature.
   b. Installation drawings showing geotextile sheet layout, location of seams, direction of overlap, and sewn seams.
   c. Downslope geotextile mat per manufacturer’s installation recommendation.
2. Samples:
   a. Geotextile: One-piece, minimum 18 inches long, taken across full width of roll of each type and weight of geotextile furnished for Project. Label each with brand name and furnish documentation of lot and roll number from which each Sample was obtained.
   b. Securing Pins: One each.

B. Informational Submittals:

1. Certifications from each geotextile manufacturer that furnished products have specified property values. Certified property values shall be either minimum or maximum average roll values, as appropriate, for geotextiles furnished.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver each roll with sufficient information attached to identify it for inventory and quality control.

B. Handle products in manner that maintains undamaged condition.

C. Do not store products directly on ground. Ship and store geotextile with suitable wrapping for protection against moisture and ultraviolet exposure. Store geotextile in way that protects it from elements. If stored outdoors, elevate and protect geotextile with waterproof cover.

1.05 SCHEDULING AND SEQUENCING

A. Where geotextile is to be laid directly upon ground surface, prepare subgrade as specified in Section 31 23 13, Subgrade Preparation, first.

B. Notify Contracting Officer whenever geotextiles are to be placed. Do not place geotextile without Contracting Officer's approval of underlying materials.

PART 2 PRODUCTS

2.01 WOVEN GEOTEXTILE

A. Composed of polymeric yarn interlaced to form planar structure with uniform weave pattern.

B. Calendared or finished so yarns will retain their relative position with respect to each other.

C. Polymeric Yarn: Long-chain synthetic polymers (polyester or polypropylene) with stabilizers or inhibitors added to make filaments resistant to deterioration due to heat and ultraviolet light exposure.

D. Sheet Edges: Selvaged or finished to prevent outer material from separating from sheet.

E. Unseamed Sheet Width: Minimum 6 feet.

F. Nominal Weight per Square Yard: 6 oz. per ASTM D5261.

G. Physical Properties: Conform to requirements in Table No. 1.

Table No. 1
Physical Property Requirements for Woven Geotextile

Property	Requirement	Test Method
Apparent Opening Size (AOS)	70 U.S. Standard Sieve Size	ASTM D4751

Table No. 1
Physical Property Requirements for Woven Geotextile

Property	Requirement	Test Method
Water Permittivity	0.28 $sec.^{-1}$, MinARV	ASTM D4491 (Falling Head)
Vertical Waterflow Rate	18 gpm/sq ft, MinARV	ASTM D4491 (Falling Head)
Grab Tensile Strength	250 lb, MinARV	ASTM D4632
Grab Elongation	15 percent, MaxARV	ASTM D4632
Wide Width Strip Tensile Strength	1740 lb/ft.-width, MinARV	ASTM D4595
Trapezoidal Tear Strength	60 lb, MinARV	ASTM D4533
Puncture Strength	120 lb, MinARV	ASTM D4833
Ultraviolet Radiation Resistance	90 percent strength retention, MinARV after 500 hours	ASTM D4355

H. Mirafi FW700 or equal.

2.02 NONWOVEN GEOTEXTILE

A. Pervious sheet of polyester, polypropylene, or polyethylene fabricated into stable network of fibers that retain their relative position with respect to each other. Nonwoven geotextile shall be composed of continuous or discontinuous (staple) fibers held together through needle-punching, spun-bonding, thermal-bonding, or resin-bonding.

B. Geotextile Edges: Selvaged or otherwise finished to prevent outer material from pulling away from geotextile.

C. Unseamed Sheet Width: Minimum 6 feet.

D. Nominal Weight per Square Yard: 4 oz. per ASTM D5261.

E. Physical Properties: Conform to requirements in Table No. 2.

Table No. 2
Physical Property Requirements for Nonwoven Geotextile

Property	Requirement	Test Method
Water Permittivity	2 $sec.^{-1}$, MinARV	ASTM D4491 (Falling Head)
Apparent Opening Size (AOS)	60 U.S. Standard Sieve Size	ASTM D4751
Grab Tensile Strength, Machine Direction	90 lb/in, MinARV	ASTM D4632
Grab Elongation, Machine Direction	50 percent, MaxARV	ASTM D4632
Puncture Strength	55 lb, MinARV	ASTM D4833
Trapezoid Tear Strength	40 lb, MinARV	ASTM D4533
Ultraviolet Radiation Resistance	70 percent strength retention, MinARV after 500 hours	ASTM D4355

F. Mirafi 140NL or equal.

2.03 DOWNSLOPE GEOTEXTILE MAT

A. Composed of three-dimensional mat with layer of double twisted hexagonal steel wire mesh with polypropylene intruded onto wire.

B. Sheet Edges: Finished to prevent outer material from separating from sheet.

C. Unseamed Sheet Width: Minimum 6 feet.

D. Nominal Weight Per Square Yard: 61.3 oz.

E. Shear Stress Resistance: 17.0 lb/ft^3.

F. UV Resistance (ASTM D4355): Stabilized.

G. Maccaferri MACMAT R8G reinforced geomat or equal.

2.04 SECURING PINS

A. Steel Rods or Bars:

1. 3/16-inch diameter.
2. Pointed at one end.
3. With head on other end sufficiently large to retain washer.
4. Minimum Length: 12 inches.

B. Steel Washers for Securing Pins:

1. Outside Diameter: Not less than 1.5 inches.
2. Inside Diameter: 1/4 inch.
3. Thickness: 1/8 inch.

C. Steel Wire Staples for Downslope Geotextile Mat:

1. U-shaped.
2. 8-gauge.
3. Minimum Length: 12 inches.

PART 3 EXECUTION

3.01 LAYING GEOTEXTILE

A. Lay and maintain geotextile smooth and free of tension, folds, wrinkles, or creases.

3.02 SHEET ORIENTATION ON SLOPES

A. Orient geotextile with long dimension of each sheet parallel to direction of slope.

B. Geotextile may be oriented with long dimension of sheet transverse to direction of slope only if sheet width, without unsewn seams, is sufficient to cover entire slope and anchor trench and to extend at least 18 inches beyond toe of slope.

3.03 JOINTS

A. Unseamed Joints:

1. Overlapped.
2. Stitch Count: Minimum three to maximum seven stitches per inch.
3. Stitch Type: Double-thread chainstitch according to ASTM D6193.
4. Sewing Machines: Capable of penetrating four layers of geotextile.

5. Stitch Location: 2 inches from geotextile sheet edges, or more, if necessary to develop required seam strength.

3.04 SECURING GEOTEXTILE

A. Secure geotextile during installation as necessary with sandbags or other means approved by Contracting Officer.

B. Secure Geotextile with Securing Pins or Staples:

1. Insert securing pins with washers through geotextile.
2. Securing Pin Alignment:
   a. Midway between edges of overlaps.
   b. 6 inches from free edges.
3. Spacing of Securing Pins:

Slope	Maximum Pin Spacing
Steeper than 3:1	2 feet
3:1 to 4:1	3 feet
Flatter than 4:1	5 feet

4. Install additional pins across each geotextile sheet as necessary to prevent slippage of geotextile or to prevent wind from blowing geotextile out of position.
5. Push each securing pin through geotextile until washer bears against geotextile and secures it firmly to subgrade.
6. Where staples are used instead of securing pins, install in accordance with alignment and spacing above. Push in to secure geotextile firmly to subgrade.

3.05 ANCHOR TRENCH

A. Per manufacturer’s recommendation.

3.06 PLACING PRODUCTS OVER GEOTEXTILE

A. Before placing material over geotextile, notify Contracting Officer. Do not cover installed geotextile until after Contracting Officer provides authorization to proceed.

B. If tears, punctures, or other geotextile damage occurs during placement of overlying products, remove overlying products as necessary to expose

damaged geotextile. Repair damage as specified in Article Repairing Geotextile.

3.07 RIPRAP APPLICATIONS

A. Overlap geotextile at each joint with upstream sheet of geotextile overlapping downstream sheet.

B. Limit height of riprap fall onto geotextile to prevent damage.

1. Drop Height: 3 feet for less than 200-pound rock.

3.08 SILT FENCE APPLICATIONS

A. Install geotextile in one piece, or continuously sewn to make one piece, for full length and height of fence, including portion of geotextile buried in toe trench.

B. Install bottom edge of sheet in toe trench and backfill in a way that securely anchors geotextile in trench.

C. Securely fasten geotextile to each support post in a way that will not result in tearing of geotextile when fence is subjected to service loads.

D. Promptly repair or replace silt fence that becomes damaged.

3.09 REPAIRING GEOTEXTILE

A. Repair or replace torn, punctured, flawed, deteriorated, or otherwise damaged geotextile.

B. Repair Procedure:

1. Place patch of undamaged geotextile over damaged area and at least 18 inches in all directions beyond damaged area.
2. Remove interfering material as necessary to expose damaged geotextile for repair.
3. Sew patches or secure them with heat fusion tacking or with pins and washers, as specified above in Article Securing Geotextile, or by other means approved by Contracting Officer.

3.10 REPLACING CONTAMINATED GEOTEXTILE

A. Protect geotextile from contamination that would interfere, in Contracting Officer’s opinion, with its intended function. Remove and replace contaminated geotextile with clean geotextile.

3.11 INSTALLATION SERVICES

A. Provide 1 day of onsite Manufacturer Representative's installation procedure oversight training, and oversight for Downslope Geotextile Mat.

END OF SECTION